

**Updated Model Report for Christina River Basin,  
Pennsylvania, Delaware, and Maryland,  
High-Flow Nutrient and DO TMDL Development**

***Draft***

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**U.S. Environmental Protection Agency  
Region 3  
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## Reasons for Updating the Model

On April 8, 2005, the Region III (Philadelphia, PA) office of the Environmental Protection Agency (EPA) established Total Maximum Daily Loads (TMDLs) for nutrients and dissolved oxygen under high-flow conditions for the portions of the Christina River Basin listed on the Clean Water Act Section 303(d) lists for the Commonwealth of Pennsylvania and the State of Delaware.

Following the establishment of the Christina River Basin TMDLs, the City of Wilmington and Delaware DNREC completed a storm-monitoring program. The goal of the storm-monitoring program was to collect nutrient and bacteria data from four storm events to establish characteristic concentrations for the CSO discharges in the City of Wilmington. Two storm events had been available in time for the April 2005 TMDL modeling effort. After April 2005, the additional storm monitoring data were available. This updated model incorporates the additional storm data to establish updated event mean concentrations (EMCs) for the Wilmington CSO discharges as documented in Table 2-1 of this report.

For the April 2005 TMDL modeling effort, groundwater flows and nutrient loads for some of the HSPF subbasins were incorrectly included twice in the EFDC receiving water quality model. This problem with the HSPF-EFDC linkage was corrected and the proper groundwater flows and loads are used for this updated modeling effort. The EFDC model was recalibrated following the correction of the problem with the groundwater loads.

The HSPF and EFDC models were calibrated using information for the 1994-1998 period, including NPDES facilities that were in existence at that time. The NPDES facilities were updated prior to the April 2005 TMDL. Additional information on the NPDES discharges has become available since issuance of the April 2005 TMDL and has been incorporated into this revised TMDL. The April 2005 model used permit limits for ammonia nitrogen of 10 mg/L and total nitrogen of 20 mg/L for the small residence discharges (flow rate of 500 gpd). For this revised TMDL, the permit limits for ammonia nitrogen and total nitrogen were changed to 30 and 40 mg/L, respectively, which are more appropriate for these types of small discharges. This change in nitrogen loading from the small residence discharges had negligible impact on receiving water quality.

Specific updates to this report include:

- Additional CSO storm monitoring data added to Table 2-1 and text changed accordingly
- Revised EFDC calibration statistics in Table 6-8
- Appendix A was updated with revised calibration time-series graphs
- Appendix B was updated with revised CSO loads based on new EMCs from storm monitoring
- Table C-1 was updated with revised NPDES information
- Table C-2 was updated with revised effluent characteristic information
- Appendix D was updated with the latest EFDC model input file listings.